ANNEX
BETWEEN
THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
AMES RESEARCH CENTER
AND
SPACE SYSTEMS LORAL, LLC
UNDER SPACE ACT UMBRELLA AGREEMENT NO. 31847/SAA2-403528
(ANNEX NUMBER ONE)

ARTICLE 1. PURPOSE

This Annex shall be for the purpose of collaborative research, development, and demonstration of algorithms, concepts, and integrated prototypes in autonomous systems and robotics. Work in this area includes:

1. Autonomous Systems, which may include technology for automated planning and scheduling (constraint-based reasoning, contingency planning, etc.), health monitoring (anomaly detection, fault detection, diagnostic, and prognostics), and autonomous operations of science and exploration systems (plan execution, discrete control, etc.)

2. Mission Operations, which may include mixed initiative planning, human-robot interaction (user interfaces, adjustable autonomy, command and control modes, etc.)

3. Robotics, which may include manipulation (robot arms, tensegrity structures, deployment devices, etc.), mobility (mechanisms, navigation, sensors, etc.), and software (frameworks, middleware, and monitoring tools).

The legal authority for this Annex, consistent with the Umbrella Agreement, is in accordance with the National Aeronautics and Space Act (51 U.S.C. § 20113(e)).

ARTICLE 2. RESPONSIBILITIES

A. NASA ARC will use reasonable efforts to:

1. Participate in technical exchange and project meetings.
2. Provide expertise in autonomous systems and robotics, including (but not limited to): planning and scheduling methods, system health monitoring, robot navigation algorithms, robot user interfaces, and robot system software.
3. Provide expertise in planetary science to inform autonomous systems and robotics design reference missions.
4. Provide expertise in robotic exploration concepts, including the design and performance of robotic scouting, site surveys, etc.
5. Provide access to ARC mobile robots and the Roverscape outdoor test area.

6. Collaborate to perform: research and development; testing and experiments; demonstrations of concepts and integrated systems; and studies of human-robot and human-system interaction.

B. Partner will use reasonable efforts to:

1. Participate in technical exchange and project meetings.
2. Provide expertise in instruments (suitable for robot integration and operation), sensors (environmental, system health, etc.), actuators, data communication systems, and other space exploration relevant technologies.
3. Provide expertise in space systems, including the design and operation of innovative, low-cost hardware and software.
4. Provide access to appropriate prototype systems and testbeds.
5. Collaborate to perform: research and development; testing and experiments; demonstrations of concepts and integrated systems; and studies of human-robot and human-system interaction.

C. Jointly the parties will use reasonable efforts to:

1. Integrate robotics (hardware and software) to demonstrate integrated advanced robotics capability for future space and lunar exploration scenarios

ARTICLE 3. SCHEDULE AND MILESTONES

The planned major milestones for the activities for this Annex defined in the "Responsibilities" Article are as follows:

Milestones	Est. Completion Date
Provide use cases for commercial space flight activities that can benefit from autonomous systems and robotics (Partner).	December 2020
Provide use cases for human exploration that can benefit from autonomous systems and robotics (NASA).	December 2020
Develop concept of operations (conops) for autonomous systems and robotics for intra-vehicular robotics supporting space exploration (Joint).	June 2021
Publish conops design (Joint)	September 2021
Develop system concepts and solutions based on the concept of operations (Joint).	December 2021
Integrate hardware/software for proof-of-concept demonstrations (Joint).	June 2022
Perform tests and demonstrations (Joint).	March 2023

Participate in technical exchange and project meetings to collaborate on research and development (Joint).	March 2023

ARTICLE 4. FINANCIAL OBLIGATIONS

There will be no transfer of funds between the Parties under this Agreement and each Party will fund its own participation. All activities under or pursuant to this Agreement are subject to the availability of funds, and no provision of this Agreement shall be interpreted to require obligation or payment of funds in violation of the Anti-Deficiency Act, (31 U.S.C. § 1341).

ARTICLE 5. INTELLECTUAL PROPERTY RIGHTS - DATA RIGHTS

A. Data produced under this Annex which is subject to paragraph C. of the Intellectual Property Rights - Data Rights Article of the Umbrella Agreement will be protected for the period of two years.

B. Under paragraph H. of the Intellectual Property Rights - Data Rights Article of the Umbrella Agreement, Disclosing Party provides the following Data to Receiving Party. The lists below may not be comprehensive, are subject to change, and do not supersede any restrictive notice on the Data provided.

1. Background Data:

The Disclosing Party's Background Data, if any, will be identified in a separate technical document.

2. Third Party Proprietary Data:

The Disclosing Party's Third Party Proprietary Data, if any, will be identified in a separate technical document.

3. Controlled Government Data:

The Disclosing Party's Controlled Government Data, if any, will be identified in a separate technical document.

4. The following software and related Data will be provided to Partner under a separate Software Usage Agreement:

ARC-15761-1: NASA Workbench (VW) v3. (NASA Open-Source software)

ARC-16341-1: Neo-Geographic Toolkit (NGT) v2. (NASA Open-Source software)

ARC-16368-1A: Robotic Application Programming Interface Delegate (RAPID) v2. (NASA Open-Source software)

ARC-16453-1: Rover Software (RoverSW): a Modular, Extensible Software Framework for Exploration Robots v.1. (NASA Open-Source software)

ARC-16457-1A: Visual Environment for Remote Virtual Exploration (VERVE) v2. (NASA Open-Source software)

ARC-17093-1: NASA Tensegrity Robotics Toolkit (NTRT) v1. (NASA Open-Source software)

ARC-17174-1: Exploration Ground Data Systems (xGDS) v1. (NASA Open-Source software)

ARC-15795-1B: Open Scheduling and Planning Interface for Exploration (Open SPIFe). (NASA Open-Source software)

ARC-15907-1: Plan Execution Interchange Language (PLEXIL). (NASA Open-Source software)

ARC-15936-1: Extensible Universal Remote Operations Planning Architecture (EUROPA) v.2.1. (NASA Open-Source software)

ARTICLE 6. TERM OF ANNEX

This Annex becomes effective upon the date of the last signature below ("Effective Date") and shall remain in effect until the completion of all obligations of both Parties hereto, or three (3) years from the Effective Date, whichever comes first, unless such term exceeds the duration of the Umbrella Agreement. The term of this Annex shall not exceed the term of the Umbrella Agreement. The Annex automatically expires upon the expiration of the Umbrella Agreement.

ARTICLE 7. RIGHT TO TERMINATE

Either Party may unilaterally terminate this Annex by providing thirty (30) calendar days written notice to the other Party.

ARTICLE 8. POINTS OF CONTACT

The following personnel are designated as the Points of Contact between the Parties in the performance of this Annex.

Management Points of Contact

NASA Ames Research Center
Matthew Holtrust
Agreements Manager
Mail Stop: 223-3, Room 100
Moffett Field, CA 94035
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Space Infrastructure and Civil Space
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Technical Points of Contact

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Laurie Chappell
Marketing Manager/BD
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Laurie.Chappell@sslmda.com
650-852-2569

ARTICLE 9. MODIFICATIONS

Any modification to this Annex shall be executed, in writing, and signed by an authorized representative of NASA and the Partner. Modification of an Annex does not modify the terms of the Umbrella Agreement.

ARTICLE 10. SIGNATORY AUTHORITY

The signatories to this Annex covenant and warrant that they have authority to execute this Annex. By signing below, the undersigned agrees to the above terms and conditions.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION AMES RESEARCH CENTER

BY: RUPAK BISWAS Digitally signed by RUPAK BISWAS Date: 2020.04.16 11:31:40 -07'00'
Dr. Rupak Biswas
Director of Exploration Technology

DATE:

SPACE SYSTEMS LORAL, LLC

BY:
Mladen Brkic
CFO

DATE: April 06, 2020